

THINGS of science



HERB SEEDS

Created and distributed without profit by Science Service, Inc., 1719 N Street, N.W., Washington, D. C. 20036. E. G. Sherburne, Jr., Director. Ruby Yoshioka, Editor.

Copyright © 1973 by Science Service, Inc.

HERB SEEDS

Various plants for many hundreds of years have been used to enhance the flavor of our foods. Such plants and also those valued for their aroma and medicinal properties are known as herbs. When herbs used for seasoning are dried, they are called spices. Spices may be the dried product of almost any part of an herb plant.

Spices were once scarce and coveted, but today they are available in great abundance in various stores and common in most households, and many of the herb plants native to the East are cultivated in comparable climates in different parts of the world.

In your unit are seeds of five species of herbs that may be grown indoors or outdoors. As they grow you will be able to study the characteristics of each of them and also enjoy their special flavors.

First identify your herb seeds and label them.

SUMMER SAVORY—The smallest of the five seeds in your unit; round, dark brown to black; about 1 mm in diameter; Labiatae or mint family.

SWEET BASIL—Black, oval-shaped; about 2 mm long; Labiatae or mint family.

CHIVES—Black, angular and cres-

cent-shaped; about $2\frac{1}{2}$ to 3 mm long; Liliaceae or lily family.

BORAGE—Large black seed, irregular oval-shaped; about 5 mm long; Boraginaceae or borage family, also referred to as forget-me-not family.

DILL—Brown with pale yellowish-brown border; flat and somewhat ellipsoid in shape; Umbelliferae or carrot family, also referred to as the parsley family.

THE SEED

Seeds vary in size from those that are almost microscopic to very large ones that are several inches in diameter. They also come in a variety of shapes as you can see from your specimens. Seeds have very definite characteristics and experts in the field can identify many plants by their seeds alone. You also can acquire this ability by observing the seeds of various plants.

Despite their shapes and sizes, all seeds have certain basic similarities. They all contain the essential materials for a future plant and in some the food necessary to begin its growth. The main parts of a seed are the seed coat, the embryo and stored nutrient which may or may not be present. The embryo is often accompanied by the endosperm a tissue in which food is stored for the early development of the embryo.

Experiment 1. The seed coat is the outer coat of the seed, tough and hard, that protects the embryo within. Examine your seeds and notice the strong outer covering of each.

The embryo is actually a tiny plant. The embryo in each of your seed specimens is so tiny it cannot be seen without magnification. Embryos consist of two main parts, the shoot or plumule that grows upward out of the soil and the radicle, or primary root, that grows down into the soil. The shoot in turn is composed of three distinct parts, one or two seed leaves or cotyledons, the epicotyl a tiny structure rising from the point of attachment of the cotyledons, and the

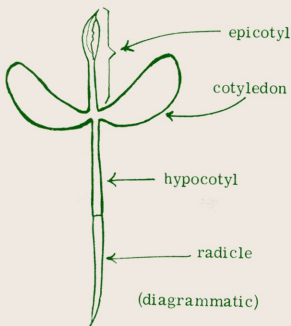


Fig. 1

hypocotyl a section between the epicotyl and radicle (Fig. 1).

Experiment 2. When a seed germinates, the root emerges first and a short time later, the shoot will appear.

Demonstrate this with one of your borage seeds. To germinate the seed, dampen a paper towel, cheese cloth or filter paper and place it inside a wide-mouthed glass jar against one side. Place the borage seed between the wet paper and the side of the jar. Allow a little water to stand in the bottom of the jar in contact with the paper to provide a continuous supply of moisture to the seed.

Place the jar in a warm dark place and observe when the root emerges. How soon after the root does the shoot appear? Can you think of any advantage to seedling for radicle to emerge prior to plumule?

Repeat the experiment with a summer savory seed.

The herbs in your unit are all angiosperms. Angiosperms are flowering plants that produce seeds enclosed in a fruit. The angiosperms are subdivided into two large groups: the dicotyledons and monocotyledons. In dicotyledons or dicots, the embryo has two seed leaves or cotyledons and in monocotyledons, or monocots, the embryo has only one cotyledon.

As the plants grow you will be able to observe some of the distinctive characteristics of the two groups, such as those mentioned below.

The veins in the leaves of dicotyledons form a network while the leaves of monocotyledons are parallel-veined. Leaves of monocots are often long and slender and sheathed at the base and without stalks or petioles. But those of dicots are usually broader and often have petioles.

The parts of the flowers of dicots usually are in fours or fives, while those of monocots are in threes or multiples of three.

Three different families of dicotyledons, Umbelliferae, Labiatae and Boraginaceae and one of monocotyledons, Liliaceae, are represented in the seeds in this unit.

PLANTING YOUR SEEDS

For outdoor planting delay sowing your seeds until after the last frost. Most seeds will not germinate until the soil warms to 60°F.

To grow your herbs successfully and produce healthy plants, it is important to prepare the bed well and provide good drainage. Choose a sunny area where the sun will shine at least half of the day.

Spade the ground deeply and lighten the soil with sand and organic matter.

Herb plants like soil that is neutral, neither too acid nor too alkaline. If you are not sure of the nature of the soil in your area, ask a neighbor or inquire at your local nursery. If necessary add garden fertilizer to the soil. Mix it in the area of your plantings.

When you are ready to sow your seeds, make shallow furrows in the prepared bed. Soil may sometimes cake around the seedlings interfering with proper growth. To prevent this, the furrows may be filled with a layer of vermiculite one inch deep. Sprinkle the vermiculite with water and then make another furrow in the vermiculite. Sow the seeds in this furrow. Cover the seeds with a thin layer of soil and water the seeds thoroughly with a gentle mist.

To slow water evaporation, cover the seeded area with newspaper placed about one to two inches above the surface of the bed. When the seedlings appear, remove the paper. When the plants are about two inches tall, they are ready to be thinned.

Experiment 3. Start a few of each of the seeds indoors so that you can watch their germination and growth closely. The seedlings may be transplanted outdoors if you wish when the weather becomes warm. Never start the seeds earlier than six weeks before you plant

them out-of-doors, since young seedlings do best.

An easy way to grow plants indoors is to cut a milk carton in half lengthwise making two waterproof trays. Purchase some bagged media, a mix sold for starting seeds, and place it in the trays. It need be only an inch or two deep. Or you can use vermiculite as the growing medium. If you use vermiculite add a little fertilizer to provide necessary nourishment for the growing seedlings.

Sprinkle the seeds on top of the soil and cover them very lightly with not more than an eighth of an inch or so of soil. For very small seeds, the covering layer should be very thin or absent to allow growth.

Cover the trays with newspaper or a pane of glass and place them in a dark warm place, never more than 70 to 75°F, until the seeds start to germinate. Remove the covering as soon as the seeds begin to sprout to avoid the chance of any fungus growth on the plants, and allow them to grow in the light, but not in direct sunshine. Be sure to keep the soil moist. The seedlings may be transplanted outdoors when the nights are no longer frosty and they are two or more inches tall. Be careful not to injure the roots when transplanting.

DRYING HERBS

Of the herbs in your unit, the sweet basil, summer savory and dill may be dried in late summer when the plants are large and stored in tightly sealed containers for later use. The chives and borage are not suitable for drying.

To dry the herbs, spread the leaves out on a wire mesh or gauze, to allow the free passage of air through the foliage, in a cool, shaded and protected area where the temperature will not rise above 100°F. The leaves should be turned from time to time to be sure all parts are dry.

When thoroughly dried, crush the leaves and put them through a sieve and store them in a tightly covered jar. If desired, the leaves may be ground into a powder with a mortar and pestle. A blender may be used for this purpose. Before storing be absolutely sure the leaves are thoroughly dry or mildew will cover the leaves rapidly.

UMBELLIFERAE

(Carrot or Parsley Family)

The Umbelliferae include some 3,000 different members. All of them are herbs with aromatic foliage. They provide us with food, condiments and attractive fragrant flowers. But the family also includes some very highly poisonous plants.

Among the most toxic of these is poison hemlock. It was the extract from this plant that Socrates was condemned to drink. All the parts of this herb are poisonous, including the roots which resemble parsnip. Another lethal member of the carrot family is cowbane, whose leaves are sometimes mistaken for celery with fatal results.

The foliage of the plants of this family is frequently profusely branched and in many of the members the stems are hollow. Umbelliferae are easy to recognize when in bloom. Their flowers grow in rounded or flattened clusters called umbels from which the name of this family is derived (Fig. 2).

There are four main parts to a flower,

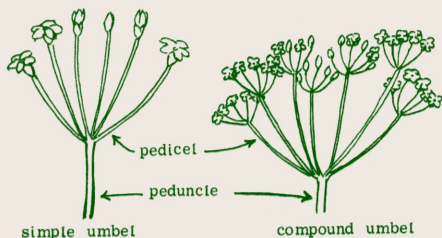


Fig. 2

the sepals, petals, stamens and pistils.

The sepals are the outermost part of the flower surrounding the petals and forming the calyx. The petals, usually just within the sepals form the corolla. The calyx and corolla together are called the perianth. The calyx usually contains the same number of sepals as the corolla does petals.

Just inside the corolla are the stamens, the male reproductive parts which are called the androecium collectively. Each stamen usually is composed of two parts, the anther containing the pollen and the stalk leading from the anther to the flower. At the center are the pistils, the female reproductive parts, called the gynoecium. Each pistil usually has three parts, the stigma at the tip for collecting pollen, the style a stalk-like part leading from the stigma to the ovary the enlarged portion at the base of the pistil. In the ovary are one or more ovules or immature seeds that later develop into seeds for future plants.

The flowers in an umbel are on individual stems or pedicels that arise from about the same point from a main axis or peduncle. A cluster of flowers and its flower forming parts, such as an umbel, is known technically as an inflorescence. The pedicels are sometimes called the rays of the umbel. The flowers are small and

complete, containing both stamens and pistils and are always fragrant.

The seed or fruit of Umbelliferae is called a schizocarp and is characteristic of this family (Fig. 3).

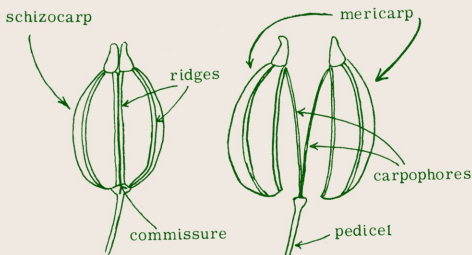


Fig. 3

When the schizocarp dries, it splits along the center into two parts called mericarps, each containing a single seed. The dividing line along which the mericarps separate is known as the commis-sure. Each mericarp is attached to a slender stalk, the carpophore, extending from the pedicel. The mericarp surrounding the seed and the seed coat enclosing the seed itself are so closely fused the whole structure is usually referred to as the seed.

In shape, the seeds of this family are ovate and curved with one side convex

and the other concave. The concave side is the commissural side. Five ridges run longitudinally along the convex side of the seed. These ridges are another characteristic of the seeds of Umbelliferae.

Extracts from the seeds of some of the Umbelliferae are still used for medicinal purposes. Dill, for example, is sometimes used as a remedy for colic. The oils of anise and dill are added to dentifrices for flavoring and to medicines to make them more palatable.

DILL

Anethum graveolens

Dill is one of the oldest herbs, an annual of the Umbelliferae family. Indigenous to the Mediterranean area and Southern Europe, it is now grown in subtropical and temperate regions all over the world. Commercially, most of the dill in the United States is grown in California. But anyone can grow it. It is large and fast growing.

It is a tall plant, erect in stem, growing to a height of two to three feet. Its leaves are finely divided and threadlike, greenish-blue in color. Its flowers are small and yellow growing in umbels that come into bloom about midsummer.

Dill today is cultivated primarily for use as a condiment, but in early times it

was widely used for its medicinal properties and was believed to have magic powers and to be a lucky omen.

Experiment 4. Examine the dill seed closely noting its curved shape. Do you see the prominent light colored ribs running longitudinally on its convex side?

Note the conspicuous winglike structure, pale yellowish brown in color, extending outward from the sides.

Experiment 5. Place a dill seed on a piece of white absorbent paper and crush it with the back of a spoon. You will obtain a tiny spot of oil. Note the strong aroma released by just one dill seed.

The seed contains a hard oily endosperm and many oil tubes within its pericarp or walls. The endosperm is the stored food inside the seed on which the embryo depends for nourishment when it first begins to grow.

Dill seeds contain from two to three percent colorless or pale yellow volatile oil. The main constituent of this oil is the organic compound carvone. Carvone is also present in high percentage in the oil of caraway seeds. Dill, therefore, is often substituted for caraway to flavor various foods.

Experiment 6. Dill is easy to grow and its seeds can be planted in any sunny area after the danger of frost is over and the soil temperature is at least 60°F. It

will germinate in about a week or 10 days and mature in about 10 weeks.

Prepare the soil and plant the seeds one-eighth inch deep and at least three feet from the next row. Scatter the seeds thinly in the furrow and cover them lightly with soil or vermiculite. Smooth over the surface so that the ground is level. It is not necessary to thin or transplant the seedlings.

As the plants grow, notice the position of the leaves on the stems and the way in which they are attached. The leaves are alternate and their stalks ensheath the stem.

Notice the color and shape of the leaves. They are bluish-green and fine and threadlike. Examine the individual leaf. Do its veins form a network?

The members of this family often branch profusely. Is this true of the dill plant?

Experiment 7. Pick some of the leaves and taste them. Note their flavor and fragrance. Break a stem and smell it. All parts of the dill are aromatic.

The dill plant is grown for both its foliage and its seed. If you wish to obtain the best dill leaves, cut them away before the plants flower.

Dill leaves are put into the brine for pickling, in vinegar to make dill vinegar, or chopped up to provide flavoring to

fish, salads and sauces. In the olden days the leaves, also called dillweed, were brewed into a tea by housewives to soothe babies with colic.

Fresh dill leaves may be washed and frozen or dried. In order to have a constant supply of fresh dill, seeds may be sown throughout the summer. The last planting date is about September 1 for most areas.

Experiment 8. Allow some of your plants to flower. Notice the tiny yellow blossoms and examine their parts. Observe the shape of the umbels.

If dill seeds are desired, allow the seeds to ripen in the blossoming plants. Harvest the seeds when they begin to turn yellowish brown. Dry the seeds in the sun and then store them in an airtight container. Dill seeds may be used whole or ground as a flavoring for pickling, in breads and to season vegetables.

Examine the seeds and see if you can recognize the structures (Fig. 3). The carpophores often remain attached to the seed. Note how the schizocarp separates into two mericarps.

Experiment 9. Allow one or two of your plants to go to seed at the end of the growing season leaving them undisturbed. The dill will self-sow and you will have a new crop of dill plants the following year.

LABIATAE

(Mint Family)

Almost all members of the Labiatae family to which the sweet basil and summer savory in your unit belong are herbs.

These aromatic plants are so distinctive in their appearance and fragrance that they have been known and valued for hundreds of years. There are some 3,000 species of Labiatae distributed in warm and temperate regions throughout the world. Members of the family are found in every continent, but they are more abundant in the Mediterranean.

The plants are important as a source of volatile aromatic oils for flavoring foods and confections, for use in medicines and perfumes as well as for garden ornamentals.

Some of the familiar plants in this family in addition to those in this unit are catnip, thyme, lavender, rosemary, sage and sweet marjoram.

Experiment 10. Examine the seeds of summer savory and sweet basil. Note how hard they are. Observe the difference in their sizes. Each fruit of this plant contains four of these nut-like seeds which are released when the fruit breaks on ripening.

Experiment 11. As your plants grow, notice the position of their leaves. They

are opposite or whorled rather than alternate as in the Umbelliferae.

Observe the way in which the leaves grow from the stems. Note that the leaves are without stalks or petioles where they attach to the main axis, or are sessile. The leaves are attached directly to the stems.

Compare the leaves of the Labiatae with those of Umbelliferae. Are the edges of the leaves smooth or toothed?

Experiment 12. Note the stems. Are they square (quadrangular)? Most Labiatae have square stems.

Experiment 13. As the plants mature, notice the position of the flowers. They are usually located at the upper part of the plant and grow from between the leaf and stem.

The inflorescence is a cyme (Fig. 4). A cyme is a flat-topped cluster composed of a few flowers in which the central flowers open slightly before the outer ones. Cymes occur usually in plants with opposite leaves.

Experiment 14. What is the shape of the flowers? The flowers of mints are distinctive. They are somewhat tubular and two-lipped. The tube of the corolla is commonly split deeply into two irregular lobes. The upper lobe consists of two upright petals and the lower lobe is composed of three petals that spread

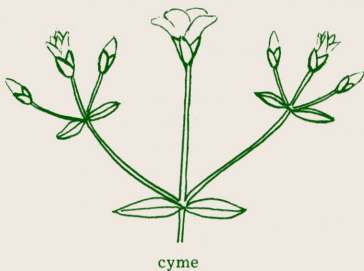


Fig. 4

out and are more or less at right angles to the upper lobes. This type of flower is known as bilabiate or two-lipped. The name Labiatae meaning lipped comes from this characteristic structure of the flower.

The oils that give the flowers their appealing fragrance are found in the glands of the calyx as well as in the petals.

SUMMER SAVORY

Satureja hortensis

Summer savory is an annual belonging to the mint family. It is an important herb used widely for flavoring a variety of foods. A native of southern Europe, it grows to about 18 inches in height.

Experiment 15. Its seeds are tiny and round as you have seen and dark brown to black in color.

Crush one of the seeds on a piece of white paper. Does an aroma emanate from the seed as from the dill seed? The seeds of Labiatae do not store the volatile oils as do those of Umbelliferae. Thus there was no significant fragrance from the crushed seed.

Experiment 16. Plant your summer savory seeds in a sunny location. Sow the seeds after the danger of frost has passed, scattering them thinly. Cover them with about $\frac{1}{4}$ inch of fine soil and press the soil down firmly. After the first leaves have appeared and the seedlings are about two inches tall, thin them to four to six inches apart.

The upper leaves of this plant branch profusely causing the plant to become somewhat top heavy. To prevent them from falling, a low wire support will help, or they may be planted near taller herbs.

Experiment 17. Note the leaves of the plant. They are smooth and narrow, growing to about one inch in length and $\frac{3}{8}$ inch wide. Are they opposite each other on the stem?

Seeds of summer savory can be planted throughout the summer so that fresh leaves for salads, soups and stews will always be available. Cut the young leaves

from the top as you use them. This will encourage the plant to branch out producing more leaves.

About midsummer you will find that the foliage begins to turn a purplish bronze color.

Experiment 18. The plant matures in about 60 days. Note the tiny pinkish-white flowers that grow between the stems and leaves. Their petals are almost hidden by the green calyx surrounding them. Pluck a few flowers and notice the cymose structure of the inflorescence.

Examine the shape of the flowers. Are they two-lipped? Can you see the petals in the upper and lower lobes?

Experiment 19. Allow one or two plants to go to seed. If left undisturbed, the plant will self-sow and you will have a patch of herbs for the following year.

Experiment 20. Taste the leaves. The leaves may be used green or dried.

For drying, cut branches back about four inches or so. This will encourage the growth of more young leaves. Spread the cuttings on a wire screen in a shady area of an airy room to dry.

At the end of the season, the whole plant may be dried by cutting them just above the roots and suspending them upside down in a shady cool place. When dried, crush the leaves and store them in an airtight jar.

SWEET BASIL

Ocimum basilicum

Sweet basil is a very fragrant popular annual herb. The herb is tropical in origin but is now cultivated all over the world. It is easily grown from seed and can be planted directly in the garden once the danger of frost has passed. To get an early start, the seed may be planted indoors if desired and then transplanted in the garden when the ground has become warm. The seeds will not germinate if the ground is cold.

Experiment 21. The hard black seeds of sweet basil are about twice as large as those of summer savory as you have observed, and oval in shape.

Sow the seeds thinly and cover them with about $\frac{1}{4}$ inch of fine soil. Be sure the ground in which the seeds are planted is dry. The seeds contain a gelatin that coats the seeds when they are exposed to water causing them to float out of the furrow. Press the soil down over the seeds firmly and then water them. If the seeds become uncovered sprinkle a little soil over them. If they remain exposed, they will become dried and fail to sprout. Under favorable conditions the seeds will germinate in four to five days.

When the seedlings are about two inches in height, thin them so that they

are at least one foot apart. The herbs grow well in any well-drained soil.

The plant will mature in about 85 days and grow to a height of one to one and a half feet.

Experiment 22. Note the bright green leaves which grow to about 1½ inches in length. Observe their shape. Are the leaves smooth and slightly toothed?

Examine the surface of the leaves and stems. Are they shiny? The leaves and stems contain many tiny oil glands which release the volatile oil that gives the plant its characteristic fragrance. Do you see any specks of oil on the leaves?

Move a stem of the plant back and forth and note the fragrant scent it releases.

Look at the underside of a leaf. Is there oil present here also? Note the texture of the leaf.

Experiment 23. Taste one of the leaves. How would you describe its flavor? After drying a leaf taste it and compare the two. Is there a difference?

Experiment 24. Notice the position of the leaves on the stem. Do they grow in opposite pairs?

Experiment 25. The flowers of sweet basil start to bloom at the end of July and continue to do so through late summer. The small, greenish-white flowers are situated between the stem and leaf.

The tiny flowers are almost hidden by their green sepals.

Pluck a few flowers and note their two-lipped structure.

To encourage the plant to branch and produce more leaves, pinch out the flowers as they appear. The fresh leaves of basil can be used with many vegetables, especially tomatoes, and in salads and soups. The foliage is most abundant in herb plants just before they flower. The early cuttings may be frozen.

Experiment 26. If you wish to dry the leaves, take cuttings just before flowering or as soon as the first tiny blossoms appear.

Experiment 27. Allow one or two plants to mature to full bloom. Note that the blossoms appear on the lower part of the plant first and then on the upper part.

Allow these two plants to go to seed and collect the seeds for planting the following year.

BORAGINACEAE

(Borage or Forget-me-not Family)

Boraginaceae are found all over the world, generally in warm and temperate regions. The plants of this family include herbs, shrubs and trees, with about 100 genera and 2,000 species. Flowers such as forget-me-not, bluebell and heliotrope

are among its members as well as the edible herb borage in this unit.

Most Boraginaceae are bristly or hairy, especially on the leaves. They are distinguished from the Umbelliferae and Labiatae in that the stems are circular and may be tapered at each end. Unlike Labiatae, the leaves are alternate in most members.

The flowers are usually small and symmetrical with five petals and shallowly funnel-shaped. The inflorescence is cymose and the ends of the floral stems are helicoid or tend to curl inward like young ferns, uncoiling as the flowers open.

BORAGE

Borago officinalis

Borage is one of the oldest garden herbs. It is an annual herb native to the Mediterranean but now found all over the world. This plant was originally cultivated for its medicinal properties and only later for its flavor. It was believed to be helpful for chest ailments.

Borage is an attractive plant with tiny blue flowers and grayish leaves. Both the flowers and the leaves of the herb are used.

Experiment 28. Compare the shape of this large, fat seed with those of the

sweet basil and summer savory. Note the irregular shape. Like Labiatae seeds, the seeds of this family are nutlets. Four of these seeds are produced by each flower. Notice the hard shell of the seed.

Sow the seed outdoors in the spring in prepared soil. Borage germinates quickly, in about a week. When the plants are large enough to handle safely, thin or transplant the seedlings so that the plants are at least one foot apart.

The seeds may also be started indoors.

Experiment 29. Examine the leaves of the plant. Are they hairy? The leaves of the borage are oval in shape and have short whitish hairs covering them.

Note the arrangement of the leaves on the stems. Are they alternate? Do the leaves have stalks or are they sessile like those of Labiatae?

Experiment 30. Taste the leaves. Do they have a cucumber-like flavor? The tender leaves of borage can be chopped up for use in salads and beverages.

The larger lower leaves of the plant may be cooked like spinach.

Experiment 31. Note the flowers when they first start to bloom. Are they pinkish at first and then turn blue later? This change in color is one of the characteristics of this family. Note the symmetrical arrangement of the petals and the sepals. Do the petals point slightly backward?

Compare the structure of the cymes of borage with those of the summer savory and sweet basil.

The flowers of borage may be floated on beverages or added to salads. They are sometimes candied. To candy the flowers, coat them with a thin film of egg white with a small soft brush and then cover them with granulated sugar. Place the flowers on a rack and allow them to dry completely.

LILIACEAE (Lily Family)

The lily family is a very large and important one, extremely rich in plants useful to man, both as ornamentals and food. Members of Liliaceae are found the world over, but in greatest number in temperate and subtropical areas. Herbs, shrubs and a few trees are included in this family of some 200 genera and 2,500 species.

Among the familiar plants are lilies, tulips and hyacinths as well as the many varieties of onions and asparagus.

Liliaceae are monocotyledons, mostly perennials having bulb or bulb-like structures at their base.

A bulb is made up primarily of modified leaves surrounding a very short stalk. The leaves referred to as scales are

usually thick and succulent containing food to nourish new plants as they grow.

Experiment 32. Cut an onion bulb exactly through the center from top to bottom and you will see the thick layers of scales tightly wrapped around each other which are actually leaves whose stalks are concentrated together at the bottom of the bulb.

On the outside of the bulb are two or more layers of leaves that are thin and dry. These protect the food-bearing leaves.

The thick leaves completely surround the central stem. From the base of the bulb grow spindly roots. Compare these roots with those of the dicotyledons.

Green new leaves grow upward from the central stalk making their way straight upward. A plant may have a single bulb or be made up of several bulbs.

The leaves of Liliaceae are simple and parallel-veined, but vary in shape widely, from hollow round leaves to broad ovate ones. The inflorescence also varies among the different species. Some have solitary flowers while umbels may be found in others. The flowers usually have an equal number of petals and petal-like sepals.

New plants in the lily family may be grown from seed, but most of them develop from the bulbs.

CHIVES

Allium schoenoprasum

Chives are a very popular perennial herb of the lily family. The genus *Allium* to which the chive belongs also includes the onion, leek and garlic.

Experiment 33. Sow the chive seeds early in the spring in rows 12 inches apart.

When they germinate, note that a single shoot grows upward through the ground, unlike the seedlings of your dicotyledon specimens which have two tiny leaves and a central stem or axis.

The chives will mature in 80 days. The plants form tiny clusters of bulbs that grow beneath the ground. Thin the plants so that you have about six little bulbs in each clump. Space the clusters about 9 inches apart. The plants can be easily transplanted.

Experiment 34. Observe the leaves, noting their shape and structure. The leaves are slender, round and hollow and grow directly from the cluster of bulbous roots. Compare them with the leaves of your other herbs.

Examine a leaf closely and note the parallel veins.

As the plant grows clip the leaves and new ones will appear. Chives grow to about 6 to 8 inches tall, and if properly

cared for will produce new leaves from year to year. If the clumps grow too large, they can be separated and transplanted.

Experiment 35. Allow some of the chives to flower. The purplish-blue flowers grow in umbels from the end of a hollow stalk.

Note the structure of the flower. How many petals do they have?

The seeds in this unit are just an introduction to the many herbs that may be planted in the home garden. Many books have been written about herbs and their culture. If you wish to look further into the subject, you will probably find many references in the local library. Here are a few titles that should be helpful.

Textbooks on botany.

Herbs for Every Garden. Gertrude B. Foster, E. P. Dutton & Co., New York.

Flowers of the World, Frances Perry, Crown Publishers, Inc., New York.

Taxonomy of Flowering Plants, C. L. Porter, W. H. Freeman and Co., San Francisco and London.

Appreciation is expressed to Dr. H. M. Cathey, Ornamental Laboratory, Agricultural Research Center, U. S. Department of Agriculture, Beltsville, Md., for reviewing this booklet.

* * *

LOOKING FOR SCIENCE FAIR IDEAS?

. . . then obtain a copy of

THOUSANDS OF SCIENCE PROJECTS at only \$1.00

Thousands Of Science Projects is a collection of titles of thousands of science projects submitted by participants in the International Science and Engineering Fair and to the Westinghouse Science Talent Search.

The titles represent projects completed by at least one student and will serve as a ready source of ideas for students of all age levels.

For your copy send order with remittance to:

THOUSANDS
c/o Science Clubs of America
Dept. TH
1719 N Street, N.W.
Washington, D.C. 20036

THINGS of science
HERB SEEDS
Science Service Washington, D. C. 20036

BACK UNITS AVAILABLE

\$1.00 each or three for \$2.50
while supply lasts.

Order by number

<u>No.</u>	<u>Title</u>
311	Rocks and Minerals of the Southwest
313	Measurement
314	Holography
317	Cast Iron
320	Glass
321	Magnetism
322	Buoyancy
326	Fiber Optics
332	Sundial
333	Sound
336	Heat and Temperature
337	Treated Cotton Fabrics

Send order with remittance to:

THINGS OF SCIENCE
Dept. 2-73
1719 N Street, N.W.
Washington, D.C. 20036



..... cut out label on other side and paste on box

THINGS of science MEMBERSHIP
12 monthly experimental kits—\$9.50

(Add postage for outside U.S.A. addresses:
Canada and Mexico \$3.00, all other \$4.00 per year.)